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Section 5

Assessments of Water Quantity and Quality

This section provides an evaluation of the current conditions in the Savannah River basin, in terms of both water quantity (Section 5.1) and water quality (Section 5.2) issues. The assessment results are then combined with the evaluation of environmental stressors from Section 4 to produce a listing of Concerns and Priority Issues in Section 6.

5.1 Assessment of Water Quantity

Water quantity information provided in this section is taken from several sources including the Water Control Manual, Savannah River Basin Multiple Purpose Projects: Hartwell Dam and Lake, Richard B. Russell Dam and Lake, J. Strom Thurmond Dam and Lake Georgia and South Carolina, US Army Corps of Engineers District, Savannah; Comprehensive Water Supply Management Plan For Chatham County Georgia; and the Georgia Department of Natural Resources, Parks, Recreation and Historic Division.

Additional water resources management issues will be addressed comprehensively as part of the Corps of Engineers Comprehensive Water Resources Management Study of the Savannah River Basin. This study is scheduled to be completed in September 2003. The following sections provide a summary of preliminary findings from these sources.

5.1.1 Municipal and Industrial Water Uses

Municipal and industrial water use projections are not available for the entire Savannah Basin, but they have been calculated for the growing area around Savannah. According to the Savannah-Chatham County estimates, total projected demands is projected to increase from 124.81 MGD in 2000 to 144.81 MGD by 2025. The projected demands includes ground and surface water demand for the Chatham County area.

Drinking Water Quality: Surface Water

Overall the surface water quality in the Savannah River basin is good for use as drinking water. All public water systems in the state of Georgia that use surface water meet federal surface water treatment rules for filtration and treatment. However, surface

water quality problems due to nonpoint source pollution such as agricultural and storm water runoff are concerns to municipalities which withdraw surface water from the Savannah River and tributaries. The contaminant of most concern is high turbidity, especially rapid increases in turbidity, due to erosion and sediment runoff. Water high in turbidity can clog filters, interrupt the proper treatment of raw water, and increase the cost of the water to the consumers because more chemicals are needed to settle out the sediment. Many water plants have reservoirs to store large amounts of water and to settle out excess sediment (turbidity). In some cases, taste and odor problems are associated with algae blooms in reservoirs, or with elevated concentrations of iron and manganese, which can arise when an anoxic, reducing environment exists in the bottom water of reservoirs. Table 5-1 summarizes the known and potential raw water quality problems affecting drinking water supplies associated with surface water intakes within the Savannah basin.

Drinking Water Quality: Groundwater

Overall ground water quality is very good for use as drinking water from wells. Since most wells used in public water systems are constructed by licensed well drillers and draw from deeper aquifers, the number of contaminated wells is small. However, in the Savannah River basin some public water system wells have been contaminated by local pollution sources such as leaky underground storage tanks, malfunctioning septic tank systems, and spills. Those wells that exceed the Maximum Contaminant Level (MCL) for a contaminant are either removed from service or added treatment to the system. Also, a few wells in the basin have been found to be under the direct influence of surface water due to the geology of the area in which the well is located. These wells are monitored and have additional treatment requirements.

Groundwater users in Richmond County have the potential to produce certain industrial contaminants from the sub-surface.

An additional area of concern is the Floridan aquifer in the coastal area of Georgia, specifically Chatham County. Sea-water is entering the aquifer in South Carolina at Port Royal Sound and beginning to move towards the production wells on Hilton Head Island and eventually towards the City of Savannah. The Georgia Environmental Protection Division has developed a policy document relating to this contamination issue called the *“Interim Strategy for Managing Salt Water Intrusion in the Upper Floridan Aquifer of Southeast Georgia”* dated April 23, 1997. Certain policy measures like reducing Floridan aquifer usage in Chatham County and limiting increased usage from the Floridan aquifer elsewhere in the coastal area are in force. Within the Savannah River basin no wells have yet been closed because of increased salt content in the aquifer and none are anticipated to be closed in the near future.

5.1.2 Agriculture

As stated in Section 3.2.2 the water demand for agricultural use in the Savannah River basin is, and will remain for the foreseeable future, a small portion of the total demand. Whether taken from surface or ground water sources, there is no reason to believe that the supply will not be adequate, even during a drought year.

5.1.3 Recreation

In the Savannah Basin the availability of water is most likely to have a significant effect on recreation through the way in which water levels are managed at Hartwell, Russell and Thurmond Lakes, the three Corps of Engineers projects. In 1994, Hartwell, Russell, and Thurmond Lakes had approximately 21 million visitors, which participated

Table 5-I. Known and Potential Raw Water Quality Problems Affecting Drinking Water Supplies in the Savannah Basin

Water System Name	Water Source Name	Number of Intakes	Reservoir that allow for WQ	No. Of Water Plants	Known Raw Water Quality Problems in the Past and Potential Future Problems	Other Comments
HUC 03060102						
Clayton-Rabun County Authority -2410118	Lake Rabun	1	Y	1	Water quality good. No known potential problems	Water in compliance. New plant.
City of Toccoa - 257001	Lake Toccoa (Cedar Creek)	1	Y	1	Water Quality good.	Water system in compliance. Plant recently upgraded.
City of Lavonia - 1190003	Lake Hartwell	1	Y	1	Water quality good.	Water Systems in compliance. Plant recently upgraded.
	Crawford Creek	1	N	1	Lake and some property around lake owned by city. Raw water turbidity spikes occasionally with heavy storm event. Shallow source with some iron and manganese-problems and taste and odor due to algae blooms.	
City of Washington - 3170002	Lake Wall (Little Beaverdam Creek)	1	Y	2	Water quality fair.	Water system in compliance. Aonia Plant is served by Clarks Hill Lake. Skull Shoals Plant by Lake Wall and Boline. Older Skull Shoals plants needs major upgrades. Aonia plant needs moderate upgrades.
	Lake Boline (Beaverdam Creek)	1	Y		Supplemental intake to Lake Wall. Potential iron and manganese problems. Larger than Lake Wall.	
	Clarks Hill Lake	1	Y		Water quality good.	
Columbia County - 0730000	Clarks Hill Lake	1	Y	2	Water quality good.	Water systems in compliance. Has intakes in HUC 03060105 and HUC 03060106 (Stevens Creek). Both plants may need to expand due to growth in the north part of the County.

Water System Name	Water Source Name	Number of Intakes	Reservoir that allow for WQ	No. Of Water Plants	Known Raw Water Quality Problems in the Past and Potential Future Problems	Other Comments
Thomson-McDuffee Co. 1890001	Clarks Hill Lake	1	Y	2	Water quality good.	Package plant water system in compliance. Has intakes in both HUC 03060105 and HUC 03060108 (Usry Lake).
City of Union Point-1330002	Sherrill's Creek Reservoir	1	Y	1	Water quality fair. Shallow source.	Water system overall in compliance. Under consent order due to lack of certified operators.
Columbia County - 073000	Stevens Creek Reservoir (Savannah River)	1	N	2	Water quality good.	Water system in compliance. Has intakes in HUC 03060105 (Clarks Hill Lake) and HUC 03060106. Both plants may need to expand due to growth in the north part of the County.
City of Augusta-Richmond County 2450000	Augusta Canal (Savannah River)	1	Y (off-site reservoir at plant 4 miles away)	1	Water quality good.	Water System in compliance.
USA Fort Gordon-2450028	Butler Creek	1	Y	1	Water quality good.	Water system in compliance. Up flow clarifiers used.
HUC 03060108						
Thomson-McDuffee County-1890000	Usry Lake	1	Y	2	Water quality fair.	Water system in compliance. Has intakes in both HUC 03060105 (Clarks Hill Lake) and HUC 03060108.
City of Waynesboro-0330004	Brier Creek	1	N	1	Water quality fair.	Water system in compliance. Recent upgrades to plant.
HUC 03060109						
Savannah I&D - 0510004	Abercorn Creek (Savannah River)	1	N	1	Water quality highly variable due to tides and brackish waters and intercoastal waterway. High organics.	Water system in compliance. Recent plant upgrades.

Water System Name	Water Source Name	Number of Intakes	Reservoir that allow for WQ	No. Of Water Plants	Known Raw Water Quality Problems in the Past and Potential Future Problems	Other Comments
City of Hartwell -1470000	Lake Hartwell (Flat Shoals Creek)	1	Y	1	Intake located in deeper area of lake. Intake located to left of bridge at Hwy. 51. Remote chance of impact from the bridge. Area of lake not well developed. Recreational boating and fishing. Turbidity spike with heavy storm event. Overall water quality good.	Water System in compliance. Plant upgraded four years ago. City and County need to work together in the protection and proper development of the area upstream intake.
City of Elberton - 1050001	Beaverdam Creek	1	N	1	Emergency intake	Water system in compliance. Need upgrades.
	Lake Russell	1	Y		Water quality good. Pump water into off stream reservoir or to plant. Very little development around the intake. Pasture land adjacent to intake.	City and County need to work together in order to protect and properly develop the area upstream of the intake.
City of Lincolnton- 1810000	Clarks Hill Lake (Soap Creek)	1	Y	1	Water quality good but subject to more turbidity spikes due to bank exposure and runoff during heavy storm events. Very little development near the intake.	Water system in compliance. Need upgrades and expansion. Needs more staff. City and County need to work together in order to protect and properly develop the area upstream of the intake.
HUC 03060104						
Banks County- 0110026	Mountain Creek Reservoir	1	Y	1	Water quality overall good. Iron and Manganese problems that potential increase with age of reservoir. Residential development increasing causing increasing amount of problems with turbidity. Higher turbidities due to potential development.	Water system in compliance. Brand new plant has Superpulsator plant.
City of Royston- 1190004	North Forks Broad River	1	N	1	Water quality OK. Prone flashing due to no reservoir. 185 corridor, local airport. Lavonia wastewater treatment plant. Intake off HWY. 51? Watershed flows through Victoria Bryant State Park.	Water system in compliance. Water plant needs upgrades. Also use spring and wells to supplement water.

Water System Name	Water Source Name	Number of Intakes	Reservoir that allow for WQ	No. Of Water Plants	Known Raw Water Quality Problems in the Past and Potential Future Problems	Other Comments
City of Commerce - 1570001	Grove River Reservoir	1	Y	1	Water quality fair. Iron and Manganese problems. Ongoing problems with taste and odor caused by algae blooms. Shallow lake with pasture lands near lake. Prone to turbidity problems from surrounding area.	Water system in compliance but needs major upgrades. Need to install solids handling capabilities. Future plans to high rate the plant for more capacity. City needs upgrade plant prior to high rate.
City of Crawford - 2210000	Long Creek	1	Y	1	Water quality fair. Shallow source in swampy area prone to taste and odor problems due to algae blooms. High turbidity event after heavy rains causing major silting problems in in-stream impoundment. High levels of iron and Manganese. Low alkalinity concerns. Concerns regarding further degradation of the water source may hamper appropriate treatment in the plant.	Water system in compliance. Needs major upgrades to small plant, possible a new plant. Need more staff. City needs to investigate in either improving in-stream impoundment or finding alternative water source.

in activities such as picnicking, camping, boating, golfing, hiking, sightseeing and fishing. Because of the significant recreational use of the three Corps projects, it is very important that water levels be kept as high as possible, especially in the spring, summer, and early fall. Water level management is as much a function of the way in which the reservoirs are operated as of water availability, however. Should the Corps of Engineers operate the dam in a manner which levels will not be kept as high as would be the case if storage were to be maximized as a precaution against a drought. Under the Corps' conservative operational philosophy, when a drought occurs there will likely be a greater chance that water levels will drop below that which supports optimum recreation potential. However, there are significant issues related to flood protection, which must be considered carefully before normal pool levels are raised.

5.1.4 Hydropower

Hartwell, Russell, and Thurmond Lakes, are authorized and operated for hydropower. Under normal conditions, the water management goals of the projects are to maximize the public benefits of hydropower, flood damage, reduction, recreation, fish and wildlife, water supply, and water quality. Hydropower production to meet peaking needs is dependent on timely release of water through the turbines in the projects. In drought conditions, the water management objectives are (a) the lake levels should not be drawn below the bottom of the conservation pool. (b) Make use of most of the available storage in the lake during the drought of record. The lake should not be drawn down entirely, as contingency against a drought that exceeds the drought of record (the drought of 1986-1989). (c) Maintain hydroelectric plant capacity throughout the drought (d) Minimize adverse impacts to recreation during the recreation season (generally considered from May 1 through Labor Day)

5.1.5 Navigation

Under the Corps of Engineers Water Control Plan, Hartwell, Russell and Thurmond Lakes projects requires adequate flows to be maintained for navigation other than during the low flow periods. Currently, relatively little commercial navigation remains on the Savannah River.

5.1.6 Waste Assimilation Capacity

Georgia has obligations under the Clean Water Act to meet instream water quality standards, and the state places a high priority on this obligation. Only under extreme drought conditions, when sufficient water flow is not available after domestic water supply needs are met, would there be insufficient water to meet instream water quality standards.

5.1.7 Assessment of Ground Water

Groundwater use is somewhat more prevalent in the lower Piedmont and upper Coastal Plain, although surface water continues to be the source of choice. From just south of Augusta to the basin's terminus at the Atlantic Ocean, groundwater is used extensively particularly in the Savannah metropolitan area. The intensity of groundwater with withdrawals from the Floridan Aquifer in Savannah, and the resultant decrease in pressure head and water quality in the aquifer, have resulted in concern about increasing future withdrawals. Subsequently, increase in industrial demand are expected are expected to be directed towards the more than ample surface water resources of the Savannah River. Future domestic demand increases are, however, expected to come from groundwater wells in western Chatham county.

Specific Ground Water Concerns

Specific groundwater concerns from certain portions of the basin and select recommendations are noted below.

Serious Floridan aquifer difficulties are being experienced in the coastal counties of Georgia impacted by the Interim Strategy. At present there are serious restrictions on use throughout the basin, including outright bans on new users in portions of southern Effingham and all of Chatham county. The agricultural area from Burke county south shall soon be included in this ban. When that occurs, new irrigation in this farming area (especially Screven county) may come to a halt. Withdrawals contribute to a regional decline in aquifer levels and cannot be continued. In the past there have also been concerns that the amount of water withdrawn from the various aquifers is leading to diminishment of river flow. There is extensive development occurring along the coastal tier of counties. Suburban growth of Effingham and Bryan counties continues unchecked. More water is being requested and cannot be approved or permitted.

Other areas of concern is the demand for groundwater in the Augusta and Richmond county areas, with the potential to mobilize the variety of contamination present in the Cretaceous aquifer in Augusta. Presently EPD is considering the denial of any additional groundwater withdrawals in Augusta, and forcing new users to go to surface water. Whether justified or not, there are also serious concerns about radioactive pollution from the Savannah River Test Site. The SRS occasionally releases Tritium in to the Savannah River directly, and concerns exist about the potential for groundwater pollution moving under the Savannah River and polluting the aquifers in Georgia. Plant Vogtle may also contribute radioactive materials to the environment.

Lastly, development of the mountain areas accelerates, with the associated demand for water resources. South Carolina demands in the north, Georgia demands in the mountain counties and demands near Athens are all accelerating withdrawals of limited Piedmont groundwater.

5.2 Assessment of Water Quality

This assessment of water quality is generally consistent with Georgia's water quality assessments for CWA Section 305(b) reporting to EPA. It begins with a discussion of (1) water quality standards, (2) monitoring programs, and (3) data analyses to assess compliance with water quality standards and determine use support. Following this introductory material, detailed assessment results by subbasin are presented in Section 5.2.4.

5.2.1 Water Quality Standards

Assessment of water quality requires a baseline for comparison. A statewide baseline is provided by Georgia's water quality standards, which contain water use classifications, numeric standards for chemical concentrations, and narrative requirements for water quality.

Georgia's water use classifications and standards were first established by the Georgia Water Quality Control Board in 1966. The water use classification system was applied to interstate waters in 1972 by EPD. Table 5-2 provides a summary of water use classifications and basic water quality criteria for each water use. Georgia also has general narrative water quality standards, which apply to all waters. These narrative standards are summarized in Table 5-3.

Table 5-2. Georgia Water Use Classifications and Instream Water Quality Standards for Each Use

Use Classification	Bacteria (fecal coliform)		Dissolved Oxygen (other than trout streams) ¹		pH	Temperature (other than trout streams) ¹	
	30-Day Geometric Mean ² (MPN/100 ml)	Maximum (MPN./100 ml)	Daily Average (mg/l)	Minimum (mg/l)		Maximum Rise (°F)	Maximum (°F)
Drinking Water requiring treatment	1,000 (Nov-April) 200 (May-October)	4,000 (Nov-April)	5.0	4.0	6.0-8.5	5	90
Recreation	200 (Freshwater) 100 Coastal)	--	5.0	4.0	6.0-8.5	5	90
Fishing Coastal Fishing ³	1,000 (Nov-April) 200 (May-October)	4,000 (Nov-April)	5.0	4.0	6.0-8.5	5	90
Wild River	No alteration of natural water quality						
Scenic River	No alteration of natural water quality						

¹ Standards for Trout Streams for dissolved oxygen are an average of 6.0 mg/l and a minimum of 5.0 mg/l. No temperature alteration is allowed in Primary Trout Streams and a temperature change of 2 °F is allowed in Secondary Trout Streams.

² Geometric means should be "based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours." The geometric mean of a series of N terms is the Nth root of their product. Example: the geometric mean of 2 and 18 is the square root of 36.

³ Standards are same as fishing with the exception of dissolved oxygen which is site specific.

Table 5-3. Georgia Narrative Water Quality Standards for All Waters (Excerpt from Georgia Rules and Regulations for Water Quality Control Chapter 391-3-6-.03 - Water Use Classifications and Water Quality Standards)

- (5) General Criteria for All Waters. The following criteria are deemed to be necessary and applicable to all waters of the State:
- (a) All waters shall be free from materials associated with municipal or domestic sewage, industrial waste or any other waste which will settle to form sludge deposits that become putrescent, unsightly or otherwise objectionable.
 - (b) All waters shall be free from oil, scum and floating debris associated with municipal or domestic sewage, industrial waste or other discharges in amounts sufficient to be unsightly or to interfere with legitimate water uses.
 - (c) All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.
 - (d) All waters shall be free from toxic, corrosive, acidic and caustic substances discharged from municipalities, industries or other sources, such as nonpoint sources, in amounts, concentrations or combinations which are harmful to humans, animals or aquatic life.
 - (e) All waters shall be free from turbidity which results in a substantial visual contrast in a waterbody due to man-made activity. The upstream appearance of a body of water shall be observed at a point immediately upstream of a turbidity-causing man-made activity. The upstream appearance shall be compared to a point which is located sufficiently downstream from the activity so as to provide an appropriate mixing zone. For land disturbing activities, proper design, installation and maintenance of best management practices and compliance with issued permits shall constitute compliance with [this] Paragraph...

In addition to the basic water quality standards shown above, Congress made changes in the Clean Water Act in 1987 which required each state to adopt numeric limits for

toxic substances for the protection of aquatic life and human health. In order to comply with these requirements, in 1989 the Board of Natural Resources adopted 31 numeric standards for protection of aquatic life and 90 numeric standards for the protection of human health. Appendix B provides a complete list of the toxic substance standards that apply to all waters in Georgia. Georgia has adopted all numeric standards for toxic substances promulgated by the USEPA. As resources are made available, Georgia is also developing site-specific standards for major lakes where control of nutrient loading is required to prevent problems associated with eutrophication.

5.2.2 Surface Water Quality Monitoring

EPD's monitoring program integrates physical, chemical, and biological monitoring to provide information for water quality and use attainment assessments and for basin planning. EPD monitors the surface waters of the state to:

- collect baseline and trend data,
- document existing conditions,
- study impacts of specific discharges,
- determine improvements resulting from upgraded water pollution control plants,
- support enforcement actions,
- establish wasteload allocations for new and existing facilities,
- verify water pollution control plant compliance,
- document water use impairment and reasons for problems causing less than full support of designated water uses, and
- develop Total Maximum Daily Loads.

EPD used a variety of monitoring tools to collect information to determine if the waterbodies are supporting its designated uses. These tools include trend monitoring, intensive surveys, lake, coastal, biological, fish tissue, and toxic substance monitoring, and facility compliance sampling. Each of these is briefly described in the following sections.

Trend Monitoring

Long term monitoring of streams at strategic locations throughout Georgia, trend or ambient monitoring, was initiated by EPD during the late 1960s. This work was and continues to be accomplished to a large extent through cooperative agreements with federal, state, and local agencies who collect samples from groups of stations at specific, fixed locations throughout the year. The cooperating agencies conduct certain tests in the field and send stream samples to EPD for additional laboratory analyses. Although there have been a number of changes over the years, routine chemical trend monitoring is still accomplished through similar cooperative agreements.

Today EPD contracts with the United States Geological Survey (USGS) for the majority of the trend sampling work, and with the U.S. Army Corps of Engineers for samples in the Savannah Harbor. In addition to monthly stream sampling, a portion of the work with the USGS involves continuous monitoring at several locations across the state. EPD associates also collect water and sediment samples for toxic substance analyses, as well as macroinvertebrate samples to characterize the biological community at selected locations as a part of the trend monitoring effort. WRD associates also assess fish communities as a part of the monitoring effort. Additional samples used in the 1997

assessment were collected by other federal, state and local governments, universities, contracted Clean Lakes projects and utility companies. Trend monitoring stations located in the Savannah basin are shown in Figure 5-1.

Focused Trend Monitoring in the Savannah River Basin

In 1995, EPD adopted and implemented significant changes to the strategy for trend monitoring in Georgia. The changes were implemented to support the River Basin Management Planning program. The number of fixed stations statewide was reduced in order to focus resources for sampling and analysis in a particular group of basins in any one year in accordance with the basin planning schedule. Sampling focus was placed on the Savannah River basin and Ogeechee River basin during the 1997 sampling. In mid-1997 an additional effort was made to provide for quarterly sampling of fecal coliform (with four samples collected in a thirty day period), and for metals sampling twice per day. To accomplish this effort sampling in the Savannah and Ogeechee basins was continued through 1998.

Figure 5-2 shows the focused trend monitoring network for the Savannah River basin used in 1997-1998. During this period statewide trend monitoring was continued at the 37 core station locations statewide, in the Savannah Harbor, and at all continuous monitoring locations. The remainder of the trend monitoring resources were devoted to the Savannah and Ogeechee River basins. In addition to chemical sampling, new work on macroinvertebrate sampling was done as a part of the Savannah River basin monitoring work. As a result, more sampling was conducted in the focus river basins. Increasing the resolution of the water quality monitoring improves the opportunity to identify impaired waters, as well as the causes of impairment.

Intensive Surveys

Intensive surveys complement long-term fixed station monitoring to focus on a particular issue or problem over a shorter period of time. Several basic types of intensive surveys are conducted, including model calibration surveys and impact studies. The purpose of a model calibration survey is to collect data to calibrate a mathematical water quality model. Models are used for wasteload allocations and/or TMDLs and as tools for use in making regulatory decisions. Impact studies are conducted when information on the cause-and-effect relationships between pollutant sources and receiving waters is needed. In many cases biological information is collected along with chemical data for use in assessing environmental impacts.

Lake Monitoring

EPD has maintained monitoring programs for Georgia's public access lakes for many years. In the late 1960s, a comprehensive statewide study was conducted to assess fecal coliform levels at public beaches on major lakes in Georgia as the basis for water use classifications and establishment of water quality standards for recreational waters. In 1972, EPD staff participated in the USEPA National Eutrophication Survey, which included 14 lakes in Georgia. A postimpoundment study was conducted for West Point Lake in 1974. Additional lake monitoring continued through the 1970s. The focus of these studies was primarily problem/solution-oriented and served as the basis for regulatory decisions.

Trophic Condition Monitoring

In 1980-1981, EPD conducted a statewide survey of public access freshwater lakes. The study was funded in part by USEPA Clean Lakes Program funds. The survey objectives were to identify freshwater lakes with public access, assess each lake's trophic

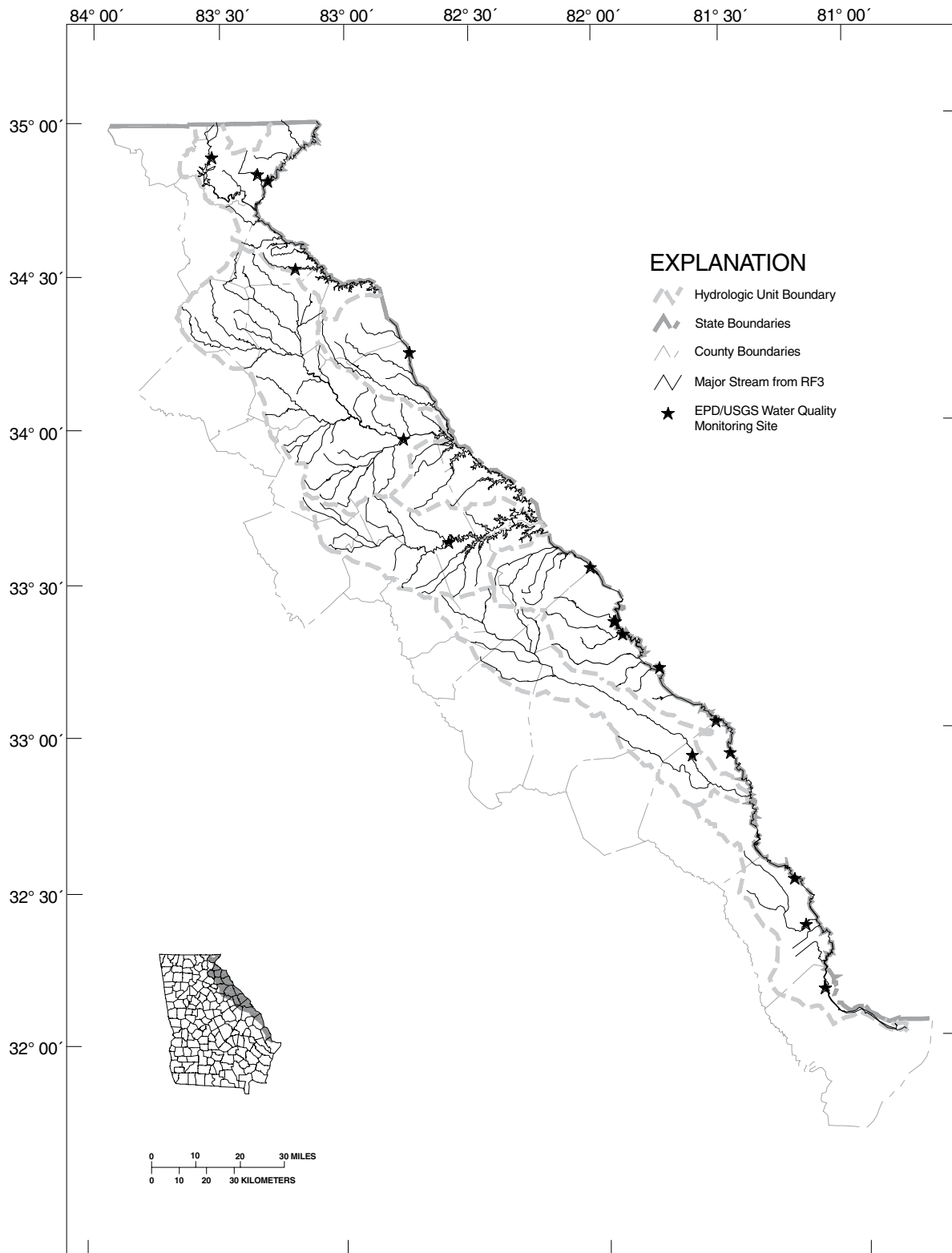


Figure 5-I. Savannah River Basin Fixed Sampling Station Locations

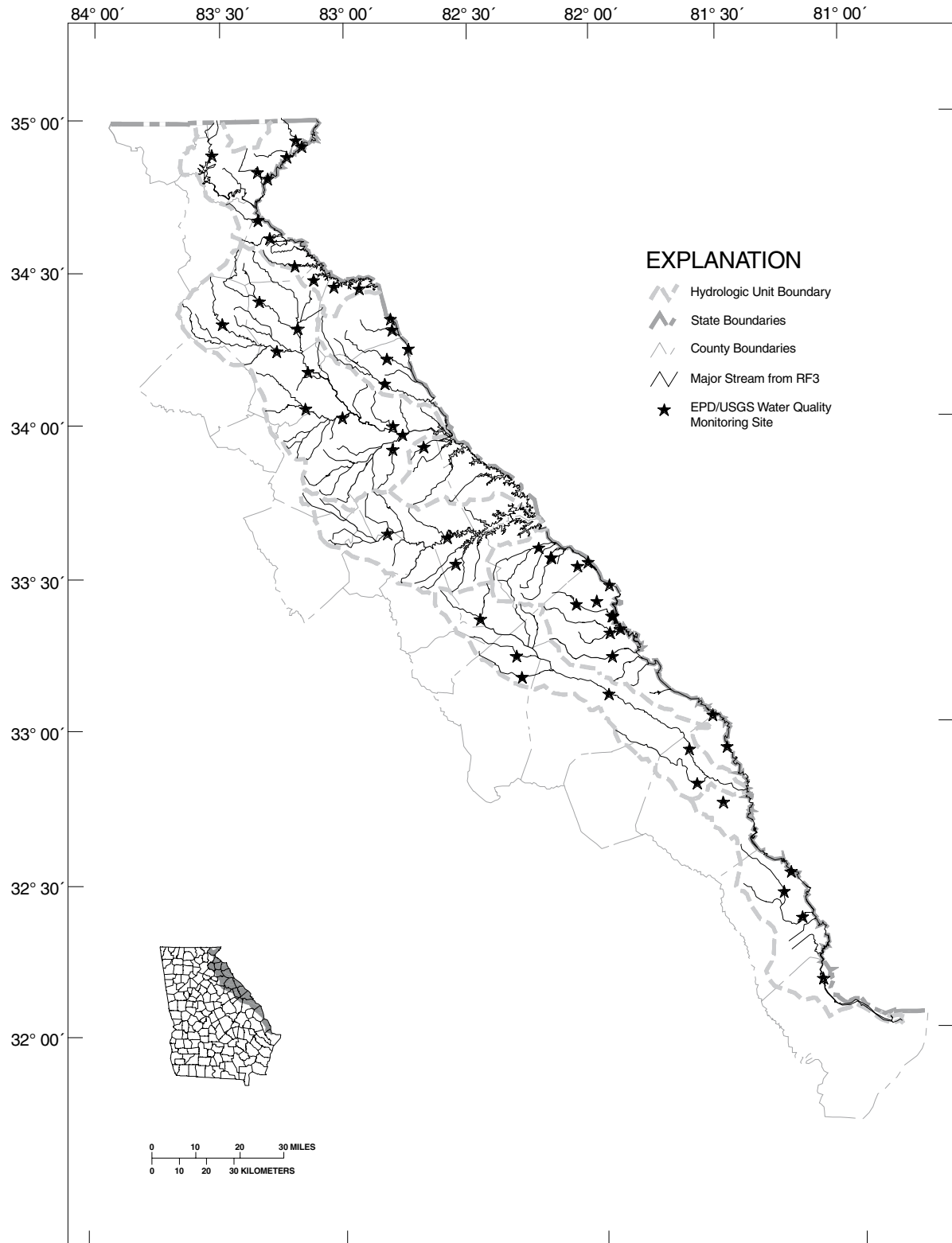


Figure 5-2. Savannah River Basin Trend Monitoring Network Station Locations

condition, and develop a priority listing of lakes as to need for restoration and/or protection. In the course of the survey, data and information were collected on 175 identified lakes in 340 sampling trips. The data collected included depth profiles for dissolved oxygen, temperature, pH, specific conductance, and Secchi disk transparency and chemical analyses for chlorophyll *a*, total phosphorus, nitrogen compounds, and turbidity. The three measures of Carlson's Trophic State Index were combined into a single total trophic state index (TTSI) and used with other field data and observations to assess the trophic condition of each lake. Higher values of the TTSI represent more eutrophic, less desirable conditions. Monitoring efforts have continued since the 1980-1981 Lake Classification Survey with a focus on major lakes (those with a surface area greater than 500 acres), and the TTSI has continued to be employed as a tool to mark trophic state trends. The major lakes in the Savannah basin are listed in Table 5-4 and are ranked according to the TTSI for the period 1984-1993. The monitoring project for major lakes became a part of the River Basin Management Planning process in 1995.

Fish Tissue Monitoring

The DNR conducts fish tissue monitoring for toxic chemicals and issues fish consumption guidelines as needed to protect human health. It is not possible for the DNR to sample fish from every stream and lake in the state. However, high priority has been placed on the 26 major reservoirs which make up more than 90 percent of the total lake acreage. These lakes will continue to be sampled as part of the River Basin Management Planning 5-year rotating schedule to track trends in fish contaminant levels. The DNR has also made sampling fish in rivers and streams down-stream of urban and/or industrial areas a high priority. In addition, DNR will focus attention on areas which are frequented by a large number of anglers.

The program includes testing of fish tissue samples for the substances listed in Table 5-5. Of the 43 constituents tested, only PCBs, chlordane, and mercury have been found in fish at concentrations which could create risk to human health from fish consumption.

Table 5-4. Major Lakes in the Savannah River Basin Ranked by Sum of Trophic State Index Values, 1980-1993

1984		1985		1986		1987		1988	
Burton	125	Burton	121	Burton	114	Burton	<119	Burton	<120
Clarks Hill	144	Clarks Hill	123	Clarks Hill	123	Clarks Hill	151	Clarks Hill	<118
Hartwell	122	Hartwell	116	Hartwell	121	Hartwell	<126	Hartwell	<114
Tugaloo	141	Tugaloo	144	Tugaloo	148	Tugaloo	166	Tugaloo	<133
Rabun	136	Rabun	122	Rabun	117	Rabun	<130	Rabun	111
Russell	136	Russell	122	Russell	131	Russell	<133	Russell	<145
range for state:	120-205	range for state:	116-188	range for state:	114-177	range for state:	<108-184	range for state:	111-178
1989		1990		1991		1992		1993	
Burton	123	Burton	138	Burton	130	Burton	149	Burton	145
Clarks Hill	153	Clarks Hill	145	Clarks Hill	146	Clarks Hill	131	Clarks Hill	153
Hartwell	138	Hartwell	136	Hartwell	132	Hartwell	138	Hartwell	146
Tugaloo	156	Tugaloo	161	Tugaloo	133	Tugaloo	157	Tugaloo	143
Rabun	128	Rabun	142	Rabun	122	Rabun	143	Rabun	140
Russell	156	Russell	142	Russell	141	Russell	147	Russell	156
range for state:	123-209	range for state:	118-182	range for state:	121-193	range for state:	131-194	range for state:	122-195

Note: Higher values represent more eutrophic conditions.

Table 5-5. Parameters for Fish Tissue Testing

Antimony	a-BHC	Heptachlor
Arsenic	b-BHC	Heptachlor Epoxide
Beryllium	d-BHC	Toxaphene
Cadmium	g-BHC (Lindane)	PCB-1016
Chromium, Total	Chlordane	PCB-1221
Copper	4,4-DDD	PCB-1232
Lead	4,4-DDE	PCB-1242
Mercury	4,4-DDT	PCB-1248
Nickel	Dieldrin	PCB-1254
Selenium	Endosulfan I	PCB-1260
Silver	Endosulfan II	Methoxychlor
Thallium	Endosulfan Sulfate	HCB
Zinc	Endrin	Mirex
Aldrin	Endrin Aldehyde	Pentachloroanisole
		Chlorpyrifos

The test results have been used to develop consumption guidelines which are updated annually and provided to fishermen when they purchase fishing licenses. This program will continue and will be coordinated as a part of the Rive Basin Management Planning process in the future.

In 1994, EPD began utilizing a “risk-based” approach to develop fish consumption guidelines for the state’s waters. The EPD’s guidelines are based on the use of USEPA potency factors for carcinogenicity and reference doses for noncancer toxicity, whichever is most protective. Inputs used in the derivation of guidelines include a 1×10^{-4} risk level for cancer, a 30 year exposure duration, 70 kg as body weight for an adult, and 70 years as the lifetime duration. A range of possible intakes from a low of 3g/day to a high of 30 g/day is evaluated and one of four different recommendations made: no restriction, limit consumption to 1 meal per week, limit consumption to 1 meal per month, or do not eat.

To address concerns about PCBs, recommendations for Lake Hartwell include a fish monitoring program to advise the public of potential health risks and a proactive education campaign which targets anglers and youth. The education campaign is part of a remediation effort that is supervised by EPA (Craig Zeller, EPA, personal communication).

Toxic Substance Stream Monitoring

EPD has focused resources on the management and control of toxic substances in the state’s waters for many years. Toxic substance analyses were conducted on samples from selected trend monitoring stations from 1973-1991. Wherever discharges were found to have toxic impacts or to include toxic pollutants, EPD has incorporated specific limitations on toxic pollutants in NPDES discharge permits.

In 1983 EPD intensified toxic substance stream monitoring efforts. This expanded toxic substance stream monitoring project includes facility effluent, stream, sediment, and fish sampling at specific sites downstream of selected industrial and municipal discharges. From 1983 through 1991, 10 to 20 sites per year were sampled as part of this project. Future work will be conducted as a part of the River Basin Management Planning process.

Facility Compliance Sampling

In addition to surface water quality monitoring, EPD conducts evaluations and compliance sampling inspections of municipal and industrial water pollution control plants. Compliance sampling inspections include the collection of 24-hour composite samples, as well as evaluation of the permittee's sampling and flow monitoring requirements.

More than 290 sampling inspections were conducted by EPD staff statewide in 1997. The results were used, in part, to verify the validity of permittee self-monitoring data and as supporting evidence, as applicable, in enforcement actions. Also, sampling inspections can lead to identification of illegal discharges. In 1997, this work was focused on facilities in the Savannah and Ogeechee River basins in support of the basin planning process.

Aquatic Toxicity Testing

In 1982 EPD incorporated aquatic toxicity testing into selected industrial NPDES permits. In January 1995, EPD issued approved NPDES Reasonable Potential Procedures, which further delineated required conditions for conducting whole effluent toxicity (WET) testing for municipal and industrial discharges. All major permitted discharges (flow greater than 1 MGD) are required to have WET tests run with each permit reissuance. Certain minor dischargers are also subject to this requirement if EPD determines that aquatic toxicity is a potential issue.

5.2.3 Data Analysis

Assessment of Use Support - General Procedures

EPD assesses water quality data to determine if water quality standards are met and if the waterbody supports its classified use. If monitoring data shows that standards are not achieved, depending on the frequency with which standards are not met, the waterbody is said to be not supporting or partially supporting the designated use (see box).

Appendix E includes lists of all streams and rivers in the basin for which data have been assessed. The lists include information on the location, data source, designated water use classification, criterion violated, potential cause, actions planned to alleviate the problem, and estimates of stream miles affected. The list is further coded to indicate status of each waterbody under several sections of the Federal Clean Water Act (CWA). Different sections of the CWA require states to assess water quality (Section 305(b)), to list waters still requiring TMDLs (Section 303(d)), and to document waters with nonpoint source problems (Section 319).

The assessed waters are described in three categories: waters supporting designated uses, waters partially supporting designated uses, and waters not supporting designated uses. Waters were placed on the partially supporting list if:

- The chemical data (dissolved oxygen, pH, temperature) indicated an excursion of a water quality standard in 11 percent - 25 percent of the samples collected.
- A fish consumption guideline was in place for the waterbody.

The partially supporting list may also include stream reaches based on predicted concentrations of metals at low stream flow (7Q10 flows) in excess of state standards as opposed to actual measurements on a stream sample. Generally, a stream reach was placed on the not supporting list if:

- The chemical data (dissolved oxygen, pH, temperature) indicated an excursion of a water quality standard in greater than 25 percent of the samples collected.
- A fish consumption ban was in place for the waterbody.
- Acute or chronic toxicity tests documented or predicted toxicity at low stream flow (7Q10) due to a municipal or industrial discharge to the waterbody.

Additional specific detail is provided in the following paragraphs on analysis of data for fecal coliform bacteria, metals, toxicity, dissolved oxygen, fish/shellfish consumption advisories, and biotic data.

5.2.4 Assessment of Water Quality and Use Support

This section provides a summary of the assessment of water quality and support of designated uses for streams and major lakes in the Savannah River basin. These results were previously provided in the Georgia 2000 305(b)/303(d) listing (Georgia DNR, 2000). A geographic summary of assessment results is provided by HUC in Figures 5-3 through 5-9.

Tugaloo River (HUC 03060102)

Appendix E summarizes the determination of support for designated uses of all assessed rivers and streams within this hydrologic unit (GA DNR, 2000).

Monitoring data was collected from 12 trend monitoring stations located within this subbasin during the 1997-1998 period, two of which were on the mainstem. Historically, one trend monitoring station has been sampled within this subbasin. The following assessment is based on data from these trend monitoring stations, as well as from samples collected by other agencies.

Data from the mainstem stations indicate that water quality conditions are being affected by nonpoint source pollution.

Metals

The water use classification of fishing was not fully supported in one tributary stream segment (Eastanolle Creek) due to exceedences of water quality standards for metals. Zinc and copper standards were exceeded in the tributary stream due primarily to urban runoff and water pollution control plant discharges.

Fecal Coliform Bacteria

The water use classifications for fishing or wild/scenic river was not fully supported in six tributary stream segments due to exceedences of the water quality standard for fecal coliform bacteria. These may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources and/or animal wastes.

Erosion and Sedimentation

The water use classifications of fishing, recreation, and drinking water are potentially threatened in waterbodies by erosion and loading of sediment which can alter stream morphology, impact habitat, and reduce water clarity. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, forestry practices, and agriculture. There are no stream segments listed at this time in this subbasin as not fully supporting designated water uses due to poor fish communities or sedimentation.

Analysis of data for fecal coliform bacteria, metals, toxicity, dissolved oxygen, fish/shellfish consumption advisories, and biotic data.*Fecal Coliform Bacteria*

Georgia water quality standards establish a fecal coliform criterion of a geometric mean (four samples collected over a 30-day period) of 200 MPN/100 mL for all waters in Georgia during the recreational season of May through October. This is the year-round standard for waters with the water use classification of recreation. For waters classified as drinking water, fishing, or coastal fishing, for the period of November through April, the fecal coliform criterion is a geometric mean (four samples collected over a 30-day period) of 1000 per 100 ml and not to exceed 4000 per 100 ml for any one sample. The goal of fecal coliform sampling in the Savannah River basin focused monitoring in 1997-1998 was to collect four samples in a thirty day period in each of four quarters. If one geometric was in excess of the standard then the stream segment was placed on the partial support list. If more than one geometric mean was in excess of the standard the stream segment was placed on the not support list.

In some cases the number of samples was not adequate to calculate geometric means. In these cases, the USEPA recommends the use of a review criterion of 400 per 100 ml to evaluate sample results. This bacterial density was used to evaluate data for the months of May through October and the maximum criterion of 4000 per 100 ml was used in assessing the data from the months of November through April. Thus, where geometric mean data was not available, waters were deemed not supporting uses when 26 percent of the samples had fecal coliform bacteria densities greater than the applicable review criteria (400 or 4000 MPN/100 mL) and partially supporting when 11 to 25 percent of the samples were in excess of the review criterion.

Metals

Since data on metals from any one given site are typically infrequent, using the general evaluation technique of 26 percent excursion to indicate nonsupport and 11 to 25 percent excursion to indicate partial support was not meaningful. Streams were placed in the nonsupporting category if multiple excursions of state criteria occurred and the data were based on more than four samples per year. With less frequent sampling, streams with excursions were placed on the partially supporting list. In addition, an asterisk appears beside metals data in those cases where there is a minimal database. Data were collected in the winter and the summer seasons for the Savannah and Ogeechee for comparison to water quality standards. Clean techniques were used. If one of the samples was in excess of the standard the stream segment was placed on the partial support list. This approach is in accordance with US EPA guidance, which suggests any single excursion of a metals criteria be listed.

Toxicity Testing/Toxic Substances

Data from EPD toxicity testing of water pollution control plant effluents were used to predict toxicity in the receiving waterbody at critical, low flows. Effluent data for metals were used to designate either partial support or nonsupport based on whether instream corroborating metals data were available. When instream metals data were available the stream was determined to be not supporting if a metal concentration exceeded stream standards; when instream data were not available, the stream was listed as partially supporting.

Dissolved Oxygen, pH, Temperature

When available data indicated that these parameters were out of compliance with state standards more than 25 percent of the time, the waters were evaluated as not supporting the designated use. Between 11 percent and 25 percent noncompliance resulted in a partially supporting evaluation.

Fish/Shellfish Consumption Guidelines

A waterbody was included in the not supporting category when an advisory for "no consumption" of fish, a commercial fishing ban, or a shellfishing ban was in effect. A waterbody was placed in the partially supporting category if a guideline for restricted consumption of fish had been issued for the waters.

Biotic Data

A "Biota Impacted" designation for "Criterion Violated" indicates that studies showed a modification of the biotic community. Communities used were fish. Studies of fish populations by the DNR Wildlife Resources Division used the Index of Biotic Integrity (IBI) to identify affected fish populations. The IBI values were used to classify the population as Excellent, Good, Fair, Poor, or Very Poor. Stream segments with fish populations rated as "Poor" or "Very Poor" were included in the partially supporting list.

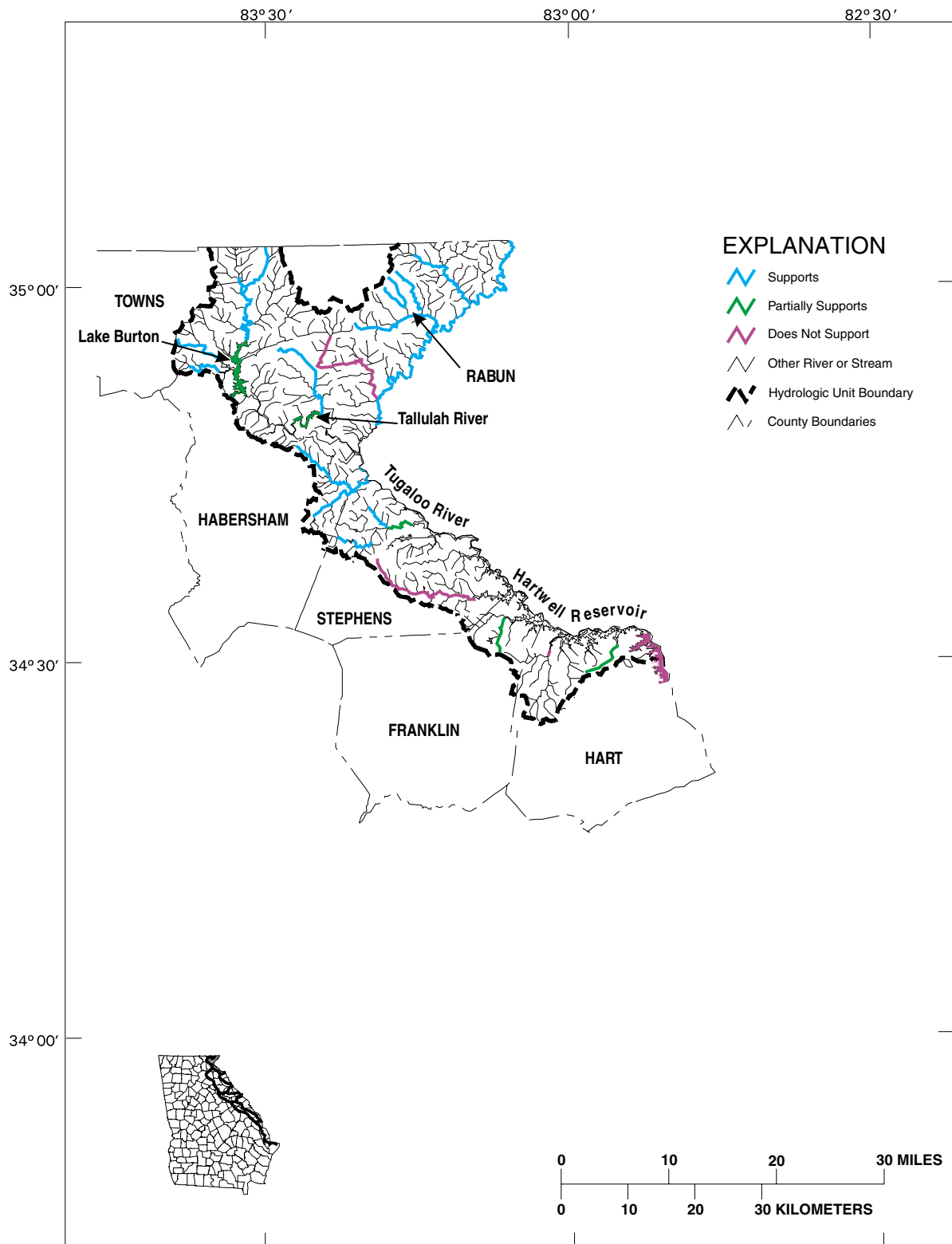
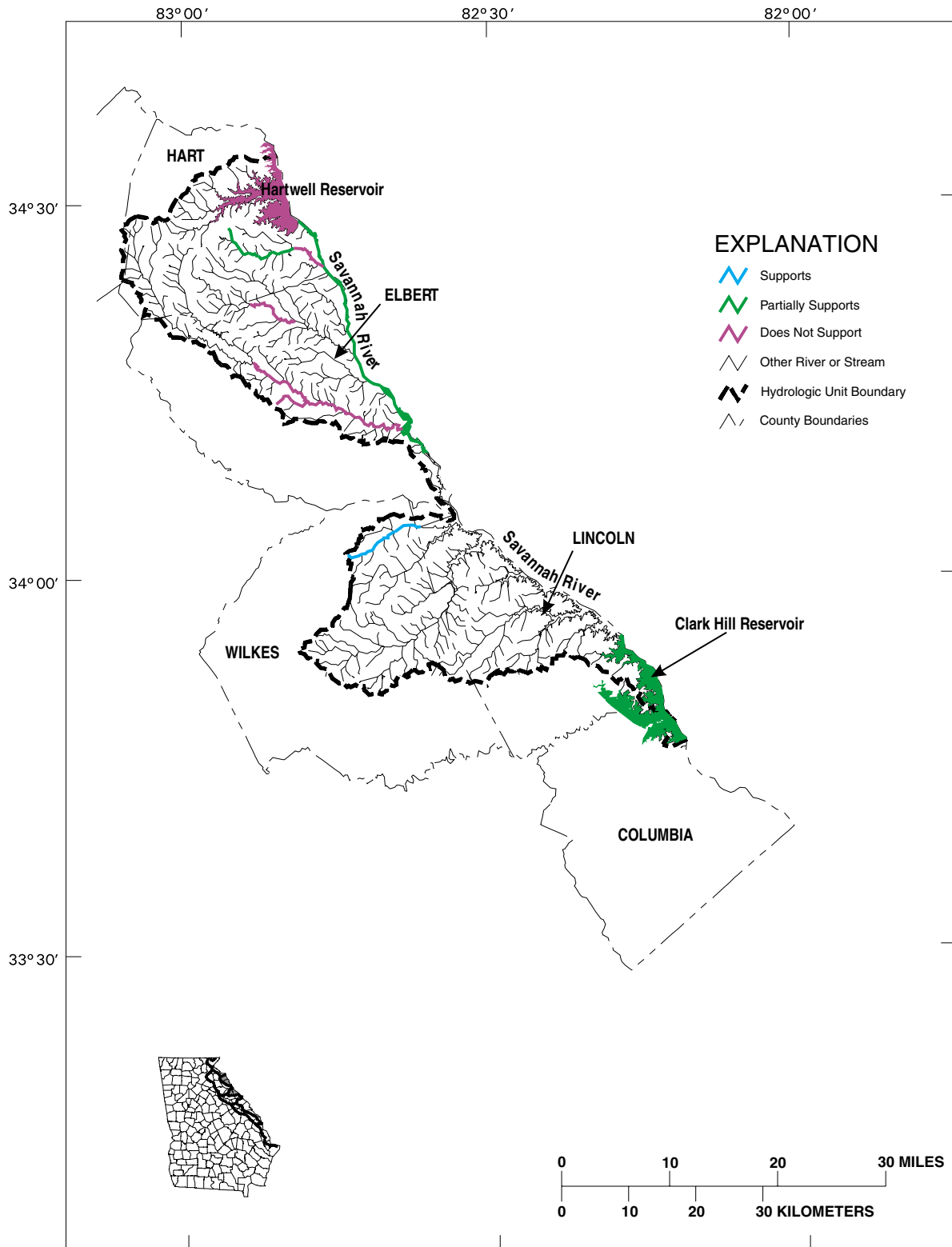


Figure 5-3. Assessment of Water Quality Use Support in the Savannah River Basin, HUC 03060102



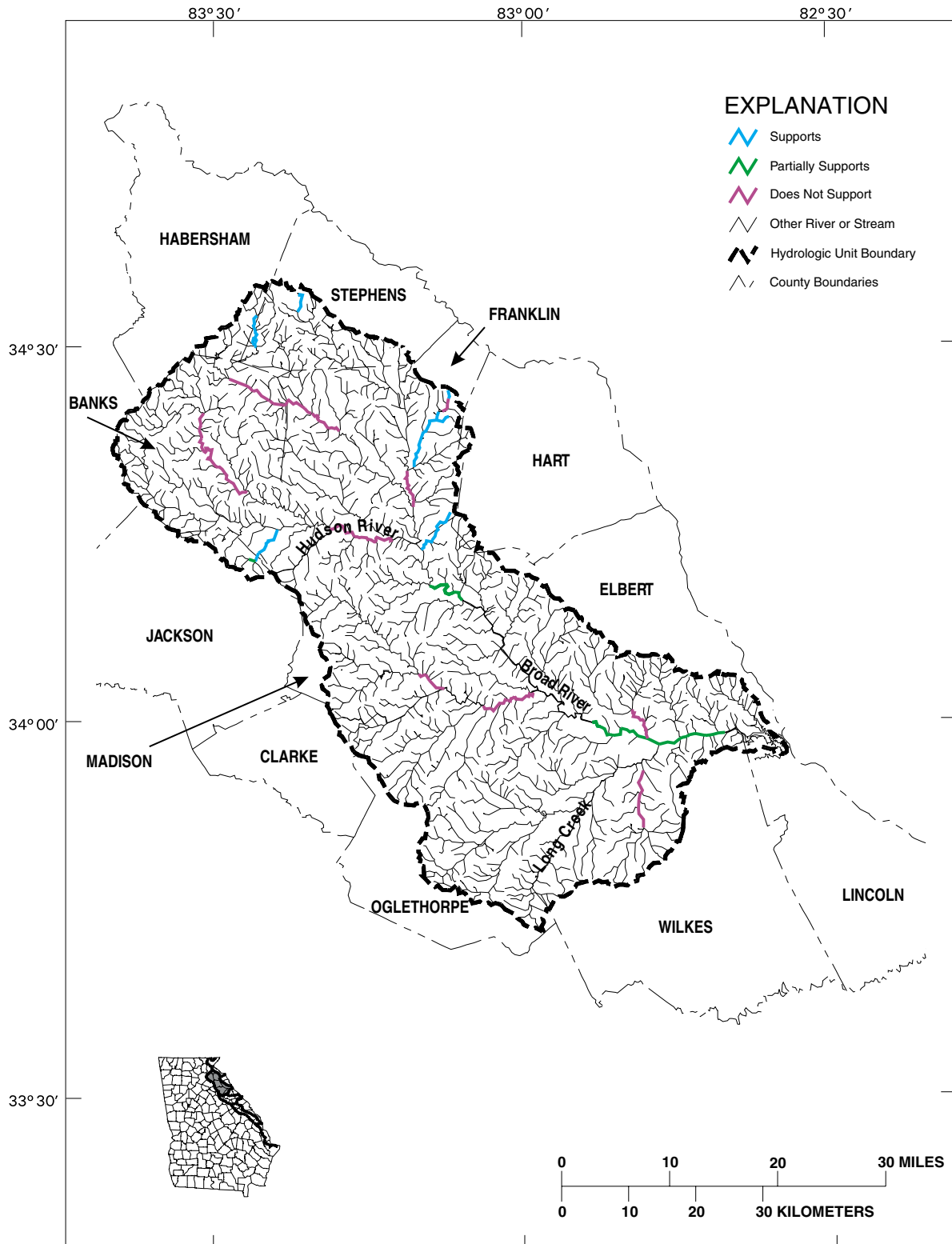


Figure 5-5. Assessment of Water Quality Use Support in the Savannah River Basin, HUC 03060104

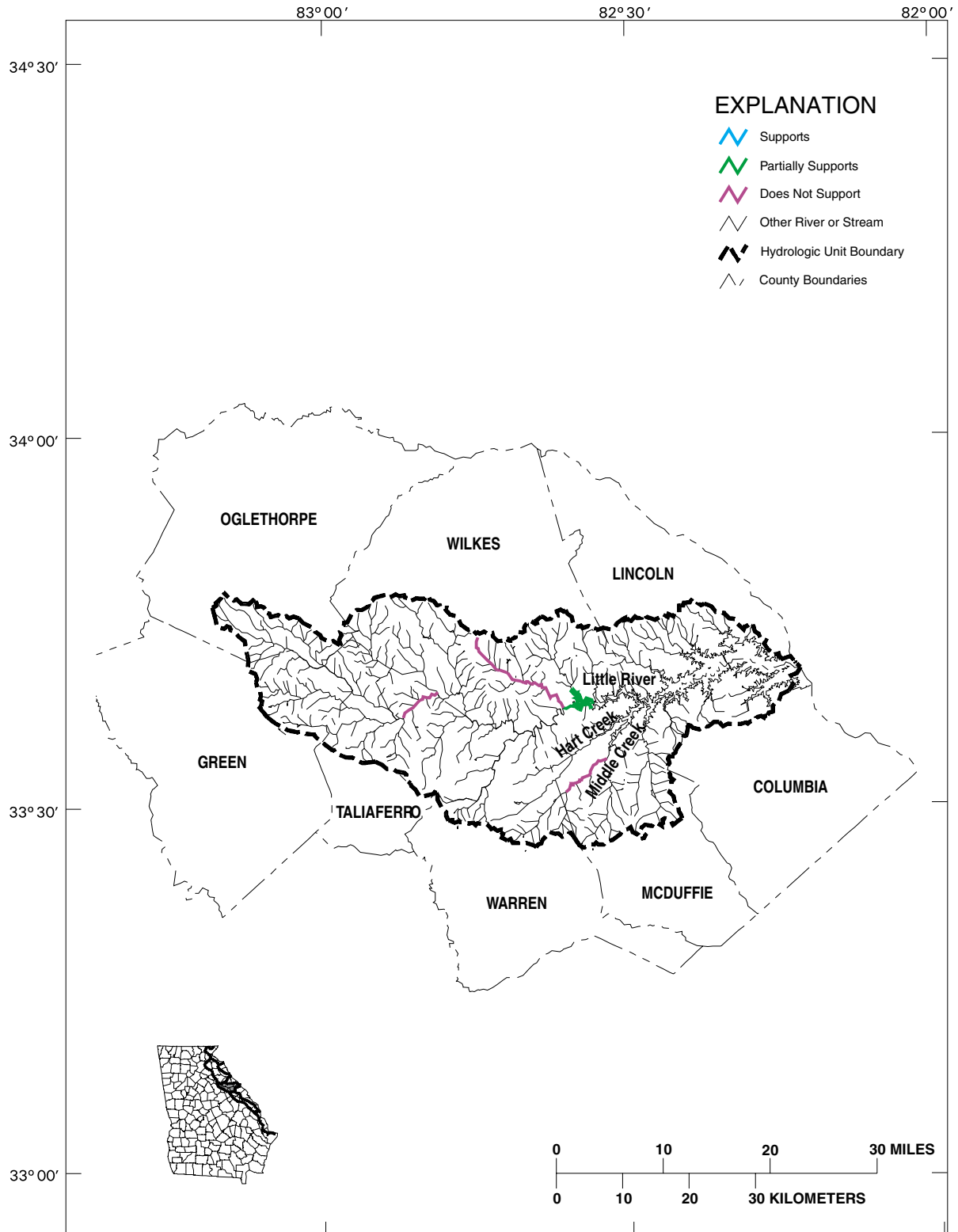


Figure 5-6. Assessment of Water Quality Use Support in the Savannah River Basin, HUC 03060105

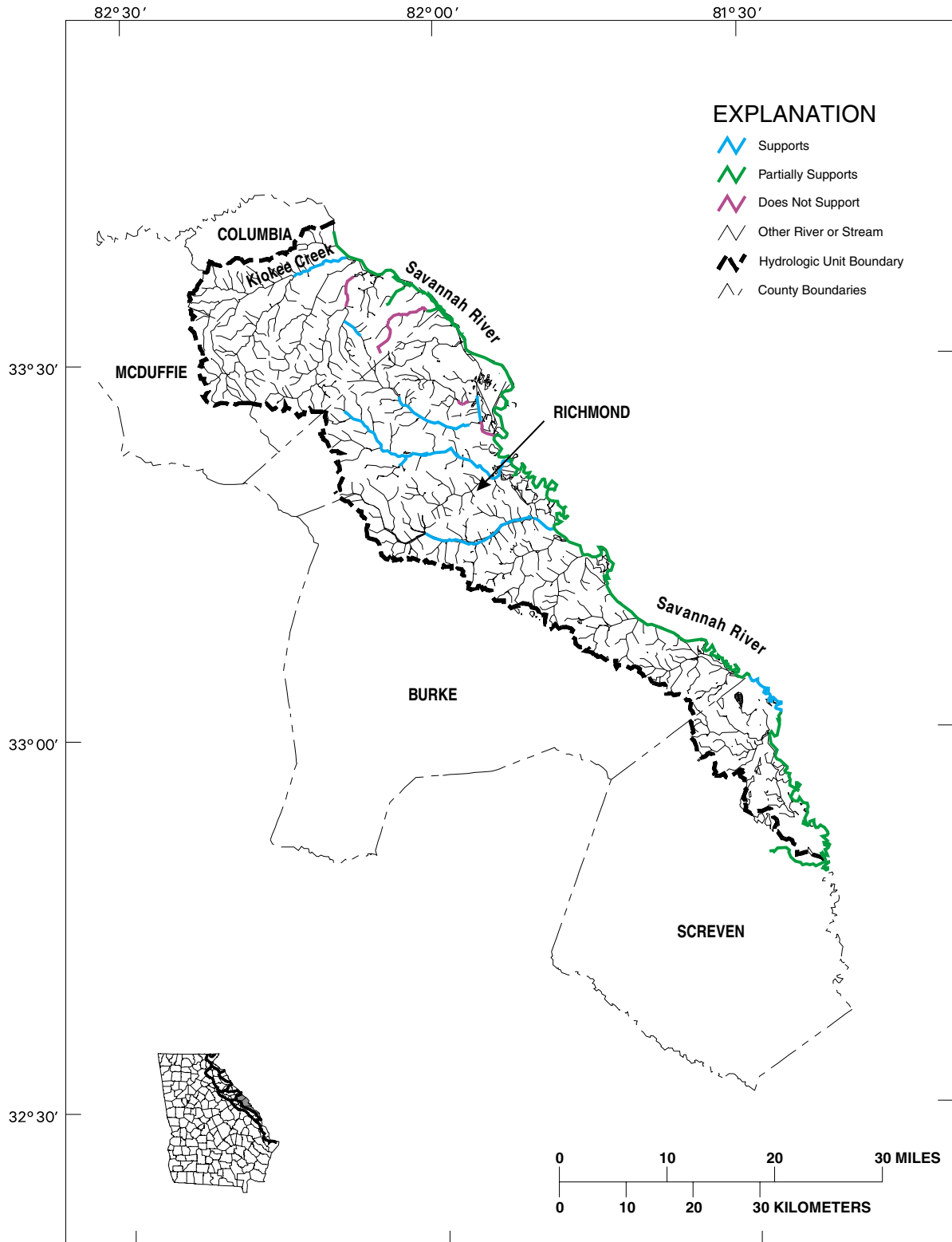


Figure 5-7. Assessment of Water Quality Use Support in the Savannah River Basin, HUC 03060106

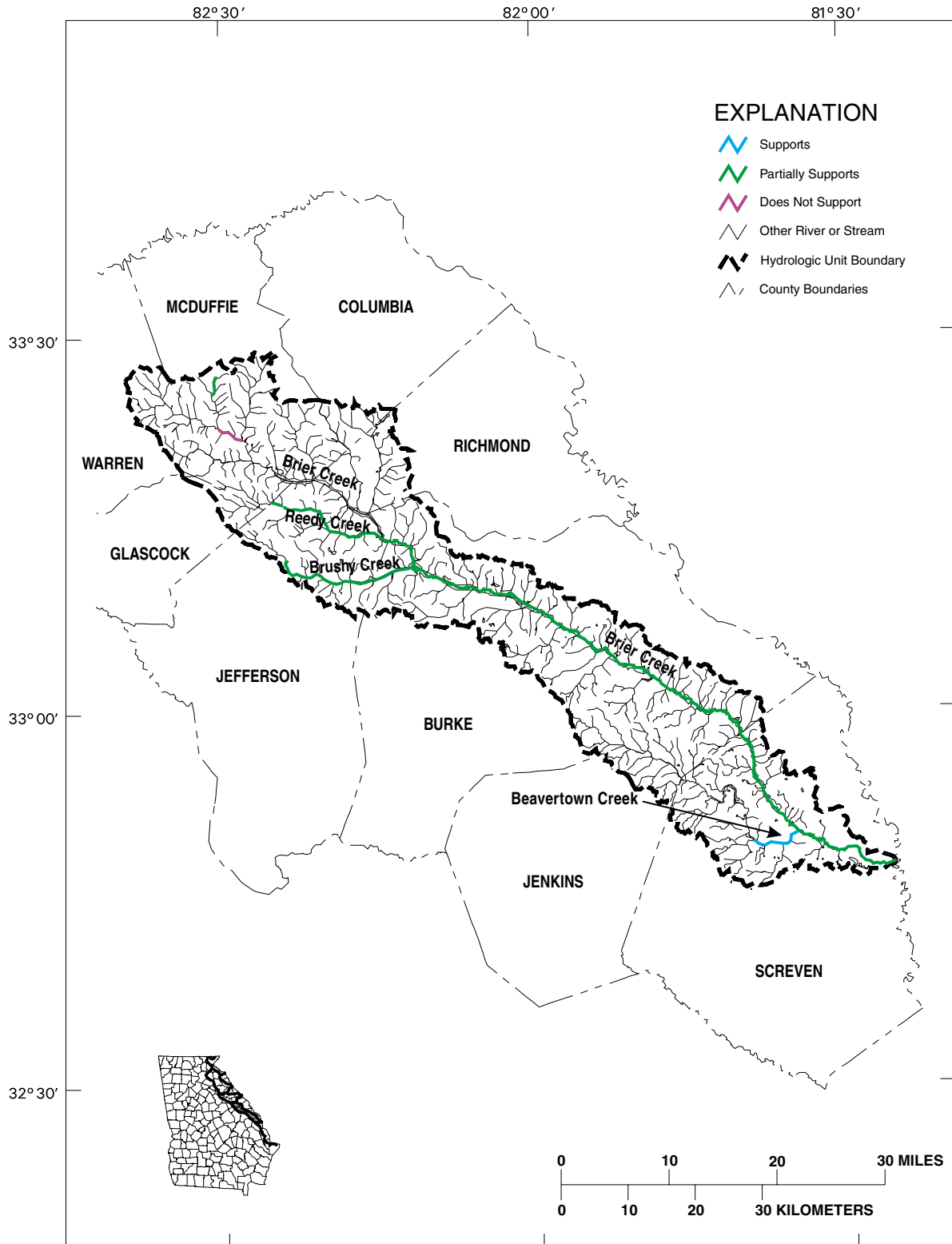


Figure 5-8. Assessment of Water Quality Use Support in the Savannah River Basin, HUC 03060108

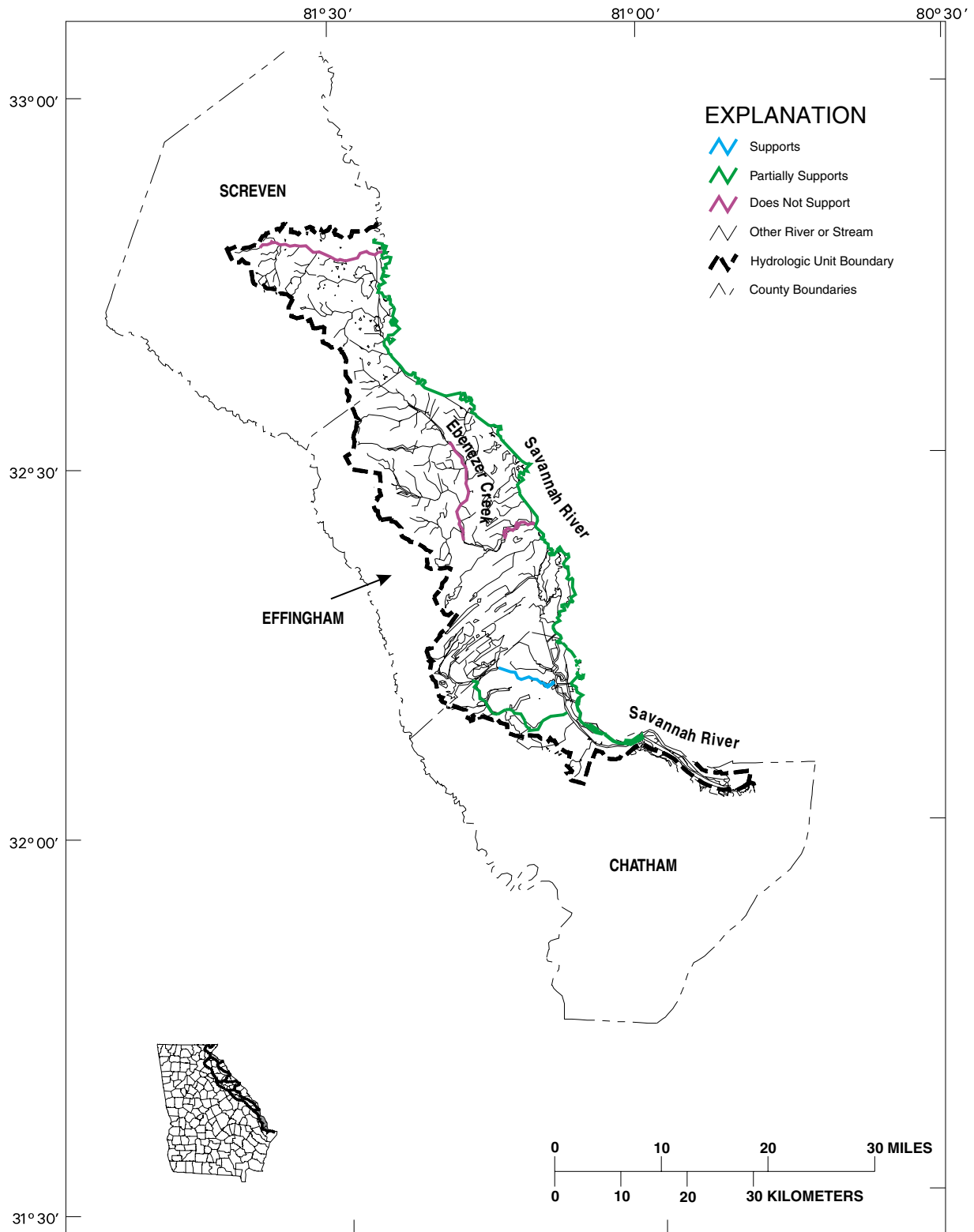


Figure 5-9. Assessment of Water Quality Use Support in the Savannah River Basin, HUC 03060109

Toxicity

The water use classification of fishing is potentially threatened in one tributary stream segment (Eastanollee Creek) due to toxicity. Aquatic toxicity tests on the Coats American, Inc. WTF effluent predicted toxicity in the receiving stream at critical, 7Q10 flows.

Fish Consumption Guidelines

The water use classification of fishing and/or recreation was not fully supported in Lakes Hartwell, Burton, Rabun, and Tugaloo based on fish consumption guidelines due to PCBs in Lake Hartwell and mercury in Lakes Burton, Rabun, and Tugaloo. The guidelines are for largemouth bass, striped/hybrid bass and channel catfish in Lake Hartwell; certain sizes of largemouth bass in Lakes Burton and Tugaloo; and, largemouth bass and white catfish in Lake Rabun.

Nutrients

The water use classification of fishing, drinking water and recreation are potentially threatened in Lake Burton, Lake Rabun and Lake Hartwell due to inputs of nutrients which may cause excess algal growths in the lakes. Nutrient sources include water pollution control plant discharges and nonpoint sources from urban and agricultural areas.

Upper Savannah River (HUC 03060103)

Appendix E summarizes the determination of support for designated uses of all assessed rivers and streams within this hydrologic unit (GA DNR, 2000).

Monitoring data was collected from 7 trend monitoring stations located within this subbasin during the 1997-1998 period, two of which were on the mainstem. Historically, no trend monitoring stations were sampled within this subbasin. The following assessment is based on data from these trend monitoring stations, as well as from samples collected by other agencies.

Data from the mainstem stations indicate that water quality conditions are being affected by dam releases.

Metals

The water use classification of fishing was not fully supported in one tributary stream segment (Cedar Creek) due to exceedences of the water quality standard for zinc due to a water pollution plant discharge.

Fecal Coliform Bacteria

The water use classification of fishing was not supported in five tributary stream segments due to the exceedence of the water quality standard for fecal coliform bacteria. These may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources and/or animal wastes.

Erosion and Sedimentation

The water use classifications of fishing, recreation, and drinking water are potentially threatened in waterbodies by erosion and loading of sediment which can alter stream morphology, impact habitat, and reduce water clarity. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, forestry practices, and agriculture. There are no stream segments listed at this time in this subbasin as not fully supporting designated water uses due to poor fish communities or sedimentation.

Low Dissolved Oxygen

The water use classification of recreation was not fully supported in one Savannah River mainstem segment due to dissolved oxygen concentrations less than standards. Low dissolved oxygen in the river segment was due to bottom water discharges from Lake Hartwell Dam.

Fish Consumption Guidelines

The water use classification was not supported in Lake Hartwell due to fish consumption guidelines primarily due to PCB's. In 1999, Georgia and South Carolina issued fish consumption guidance reflecting a joint reevaluation of data for Lake Hartwell. In Georgia these are for the Tugaloo Arm and for the main body in the dam forebay. In the Tugaloo Arm, hybrid and striped bass over 16 inches should not be eaten and restricted consumption of certain sizes of largemouth bass (PCB's and mercury) and channel catfish (PCB's) is recommended. In the lake main body, any size of hybrid or striped bass should not be eaten, and restricted consumption of largemouth bass and channel catfish is recommended.

The water use classification of fishing and/or recreation was not fully supported in Lakes Richard B. Russell and Clarks Hill (Strom Thurmond) based on fish consumption guidelines due to mercury. The guidelines are for largemouth bass and catfish in both lakes.

Nutrients

The water use classifications of fishing, drinking water and recreation are potentially threatened in Lake Hartwell due to inputs of nutrients which may cause excess algal growth in the lake. Nutrient sources include water pollution control plant discharges and nonpoint sources from urban and agricultural areas.

Broad River (HUC 03060104)

Appendix E summarizes the determination of support for designated uses of all assessed rivers and streams within this hydrologic unit (GA DNR, 2000).

Monitoring data was collected from 11 trend monitoring stations located within this subbasin during the 1997-1998 period, two of which were on the mainstem. Historically, no trend monitoring stations were sampled within this subbasin. The following assessment is based on data from these trend monitoring stations.

Data from the mainstem stations indicate that water quality conditions are being affected by nonpoint source pollution.

Fecal Coliform Bacteria

The water use classification of fishing was not fully supported in ten tributary stream segments due to exceedences of the water quality standard for fecal coliform bacteria. These may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources and/or animal wastes.

Erosion and Sedimentation

The water use classifications of fishing, recreation, and drinking water are potentially threatened in waterbodies by erosion and loading of sediment which can alter stream morphology, impact habitat, and reduce water clarity. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, forestry practices, and agriculture. There are no stream segments listed at this time in this subbasin as not fully supporting designated water uses due to poor fish communities or sedimentation.

Fish Consumption Guidelines

The water use classification of fishing was not fully supported in Nancy Town Lake based on fish consumption guidelines due to chlordane residuals in bream.

Low Dissolved Oxygen

The water use classification of fishing was not fully supported in two tributary stream segments (Bear Creek and Beaverdam Creek) due to dissolved oxygen concentrations less than standards due to water pollution control plant discharges.

Little River (HUC 03060105)

Appendix E summarizes the determination of support for designated uses of all assessed rivers and streams within this hydrologic unit (GA DNR, 2000).

Monitoring data was collected from 3 trend monitoring stations located within this subbasin during the 1997-1998 period, two of which were on the mainstem. Historically, no trend monitoring stations were sampled within this subbasin. The following assessment is based on data from these trend monitoring stations.

Data from the mainstem stations indicate that water quality conditions are being affected by urban runoff and nonpoint source pollution.

Fecal Coliform Bacteria

The water use classification of fishing was not fully supported in three tributary stream segments due to exceedences of the water quality standard for fecal coliform bacteria. These may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources and/or animal wastes.

Erosion and Sedimentation

The water use classifications of fishing, recreation, and drinking water are potentially threatened in waterbodies by erosion and loading of sediment which can alter stream morphology, impact habitat, and reduce water clarity. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, forestry practices, and agriculture. There is one stream segment listed in this subbasin as not fully supporting designated water uses based on biological community which may be due to sedimentation.

Fish Consumption Guidelines

The water use classification of fishing was not fully supported in the Little River mainstem above and below Rocky Creek based on fish consumption guidelines due to mercury. The guidelines are for largemouth bass.

Nutrients

The water use classification of fishing, drinking water and recreation are potentially threatened in the Little River Arm of Clarks Hill Lake due to inputs of nutrients which may cause excess algal growth in the lake. Nutrient sources include water pollution control plant discharges and nonpoint sources from urban and agricultural areas.

Middle Savannah River (HUC 03060106)

Appendix E summarizes the determination of support for designated uses of all assessed rivers and streams within this hydrologic unit (GA DNR, 2000).

Monitoring data was collected from 15 trend monitoring stations located within this subbasin during the 1997-1998 period, seven of which were on the mainstem.

Historically, one trend monitoring station has been sampled within this subbasin. The following assessment is based on data from these trend monitoring stations, as well as from samples collected by other agencies.

Data from the mainstem stations indicate that water quality conditions are being affected by urban runoff, water pollution control plant discharges, dam releases, and nonpoint source pollution.

Metals

The water use classification of fishing was not fully supported in one Savannah River mainstem segment and in two tributary stream segments (Butler Creek). The water quality standard for selenium was exceeded in this segment.

Fecal Coliform Bacteria

The water use classification of fishing was not fully supported in one Savannah River mainstem segment, and in seven tributary stream segments due to exceedences of the water quality standard for fecal coliform bacteria. These exceedences may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources and/or animal wastes.

Erosion and Sedimentation

The water use classifications of fishing, recreation, and drinking water are potentially threatened in waterbodies by erosion and loading of sediment which can alter stream morphology, impact habitat, and reduce water clarity. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, forestry practices, and agriculture. There are no stream segments listed at this time in this subbasin as not fully supporting designated water uses due to poor fish communities or sedimentation.

Fish Consumption Guidelines

The water use classification of fishing and/or drinking water was not fully supported in the middle Savannah River based on fish consumption guidelines due to mercury. The guidelines are for largemouth bass and spotted sucker.

Low Dissolved Oxygen

The water use classification of fishing water and/or drinking was not fully supported in two Savannah River mainstem segments and one tributary stream segment (Butler Creek) due to dissolved oxygen concentrations less than standards. Low dissolved oxygen in the river segments was due to bottom water discharges from dams, and low dissolved oxygen in the tributary was due to urban runoff and a water pollution control plant discharge.

Toxicity

The water use classification of fishing is potentially threatened in one tributary stream segment (Rocky Creek) due to toxicity.

Brier Creek (HUC 03060108)

Appendix E summarizes the determination of support for designated uses of all assessed rivers and streams within this hydrologic unit (GA DNR, 2000).

Monitoring data was collected from 6 trend monitoring stations located within this subbasin during the 1997-1998 period, two of which were on the mainstem. Historically, no trend monitoring stations were sampled within this subbasin. The following assessment is based on data from these trend monitoring stations.

Data from the mainstem stations indicate that water quality conditions are being affected by nonpoint source pollution.

Fecal Coliform Bacteria

The water use classification of fishing was not fully supported in three tributary streams (Brushy, Reedy, and Brier Creeks) due to exceedences of the water quality standard for fecal coliform bacteria. These may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources, and/or animal wastes.

Erosion and Sedimentation

The water use classifications of fishing, recreation, and drinking water are potentially threatened in waterbodies by erosion and loading of sediment which can alter stream morphology, impact habitat, and reduce water clarity. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, forestry practices, and agriculture. There are no stream segments listed at this time in this subbasin as not fully supporting designated water uses due to poor fish communities or sedimentation.

Fish Consumption Guidelines

The water use classification of fishing was not fully supported in one tributary (Brier Creek) segment based on fish consumption guidelines due to mercury. The guidelines are for largemouth bass and spotted sucker.

Toxicity

The water use classification of fishing was not fully supported in one tributary stream segment (Whites Creek) due to toxicity. Aquatic toxicity tests on the Thomson Water Pollution Control Plant effluent predicted toxicity in the receiving stream at critical, 7Q10 low flow conditions.

Lower Savannah River (HUC 03060109)

Appendix E summarizes the determination of support for designated uses of all assessed rivers and streams within this hydrologic unit (GA DNR, 2000).

Monitoring data was collected from 6 trend monitoring stations located within this subbasin during the 1997-1998 period, two of which were on the mainstem. Historically, two trend monitoring stations were sampled within this subbasin. The following assessment is based on data from these trend monitoring stations, as well as from samples collected by other agencies.

Data from the mainstem stations indicate that water quality conditions are being affected by nonpoint source pollution.

Metals

The water use classification of fishing was not fully supported in one tributary stream segment (Buck Creek) due to exceedences of water quality standards for copper due to nonpoint sources and a water pollution control plant discharge.

Fecal Coliform Bacteria

The water use classification of fishing was not fully supported in one tributary stream segment (Runs Branch) and one estuarine water (Savannah Harbor) due to exceedences of the water quality standard for fecal coliform bacteria. These exceedences may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources and/or animal wastes.

Erosion and Sedimentation

The water use classifications of fishing, recreation, and drinking water are potentially threatened in waterbodies by erosion and loading of sediment which can alter stream morphology, impact habitat, and reduce water clarity. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, forestry practices, and agriculture. There are no stream segments listed at this time in this subbasin as not fully supporting designated water uses due to poor fish communities or sedimentation.

Fish Consumption Guidelines

The water use classification of fishing, drinking water and/or coastal fishing was not fully supported in one tributary segment (Pipemaker Canal) and the Savannah River mainstem based on fish consumption guidelines due to mercury. The guidelines are for largemouth bass and channel catfish in the river, and largemouth bass in the tributary.

Low Dissolved Oxygen

The water use classification of fishing was not fully supported in three tributary stream segments (Buck Creek, Ebenezer Creek and Runs Branch) due to dissolved oxygen concentrations less than standards. Low dissolved oxygen in two of the tributaries was due to nonpoint sources (Ebenezer Creek and Runs Branch), and a water pollution control plant contributed to the problem in Buck Creek.

5.2.5 Assessment of Fish and Wildlife Resources

Detailed, HUC-level assessments of fish and wildlife resources in the Savannah River basin were not available at the time of compilation of the basin plan. However, rough, basin-scale assessments of fish and wildlife resources have been developed as part of the RiverCare 2000 Georgia Rivers Assessment (EPD, 1998). These results are summarized below.

Ecologically Important Fish Resources

Georgia's fishery resources depend on healthy streams and are part of a diverse community of game and nongame species. These communities by definition include vertebrates like fishes and invertebrates like mussels and aquatic insects. A complete community with all species that naturally occur in a particular river system is irreplaceable. Only a few species can be propagated and restocked into nature. The life found in a Georgia river depends absolutely on the integrity of aquatic habitat, which in turn directly reflects the conditions within the rivers' entire upstream watersheds. Healthy aquatic ecosystems can provide sustainable commercial and recreational fisheries, which are valuable in their own right. The secondary effects often associated with the pursuit of these fisheries adds even more value to Georgia's local economies.

The major threats to ecologically important fish resources come from nonpoint source pollution and the effects of other human activities in the environment. Clearing vegetation, disturbing earth without adequately controlling the movement of sediment, increasing impervious surface, and related activities in a watershed can alter water quality and patterns of stream discharge. Altering river channels, by dredging or by removing snag that furnish many prey organisms for fish, also reduce the quality and quantity of fish habitat. These activities lower the value of streams for fish populations.

Another significant threat to Georgia's fish species is the introduction of exotic, or foreign, species. Many introduced species, such as flathead catfish and blueback herring, compete with native fish for food and cover, take them as food, or parasitize them.

Illegally introduced blueback herring may negatively impact reservoir sport fisheries in the low-productivity, tributary reservoirs by outcompeting young-of-year sunfishes for food and by direct predation on larval and fingerling sunfishes. If the new species are so successful that they reduce or eliminate the native population, they can significantly reduce the river's fishery biodiversity as well.

In 1998, robust redhorse were discovered in the Savannah River downstream of Augusta. Robust redhorse were once thought to be extant; therefore, GADNR is expending considerable effort to propagate this imperiled species and reintroduce hatchery-reared fingerlings into its native range. Current stocking efforts have focused on the Broad River, a major tributary of the Savannah River.

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